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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,736	07/13/2001	Roger L. Frick	30203/37263	5345

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EXAMINER	
DINH, JACK	

ART UNIT	PAPER NUMBER
2873	

DATE MAILED: 10/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/905,736	Applicant(s) FRICK ET AL.	
	Examiner Jack Dinh	Art Unit 2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 March 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0304*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *DETAILED ACTION*.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

1. Claims 1-4, 8-12, 14, 15, 20-25, 27-31, 33, 34, 36, 37, 39, 40, 43-46 and 48, are rejected under 35 U.S.C. 102(a) as being unpatentable by Chen et al. (US Patent 6,433,911).

Regarding claim 1, Chen (figure 2) is interpreted as disclosing an optical switch comprising a substrate **202** for transmitting an optical signal **206** within the substrate, where the optical signal propagates in the substrate in a first direction under total internal reflection, and a diffractive optical element **205** disposed above a top surface of the substrate and moveable relative thereto between a first position substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second position in evanescent field coupling with the optical signal to alter the propagation of the optical signal into a second direction.

Regarding claim 2, Official Notice is taken that materials such as quartz and sapphire are very well known in the art to be used as substrates.

Regarding claim 3, Official Notice is taken that the use of holographic grating is very well known in optical switching functions (see reference provided below).

Regarding claim 4, Chen (figure 10) is interpreted as further disclosing that the diffractive optical element is formed of a plurality of strips **1004** and **1006** forming a diffraction grating, where each strip has a substantially equal width and where each of the strips are spaced apart a substantially equal spacing.

Regarding claim 8, Chen (figure 10) is interpreted as further disclosing that the strips are flexible for moving the diffractive optical element between the first position and the second position.

Regarding claim 9, Chen (figure 2) is interpreted as further disclosing that the strips are suspended from an anchor **204** fixedly mounted to the substrate.

Regarding claim 10, Chen (figure 6) is interpreted as further disclosing that the strips are suspended from a first anchor and a second anchor by flexible members **504**, where both the first anchor and the second anchor are fixedly mounted to the substrate and where the flexible members allow movement of the diffractive optical element between the first position and the second position.

Regarding claim 11, Chen (figures 8 & 9) is interpreted as further disclosing that the strips are biased in the second position, and wherein an electrode **812** is disposed adjacent the strips for moving the strips into the first position.

Regarding claim 12, Chen (figure 5) is interpreted as further disclosing that the strips are linear and substantially perpendicular to the line bisecting an angle between the plane containing the input signal and the plane containing the output signal.

Regarding claims 14 and 15, Chen is interpreted as further disclosing that the strips are formed of poly silicon (col. 2, lines 45-53).

Regarding claim 20, Chen (figure 6) is interpreted as disclosing that the diffractive optical element is in physical contact with the top surface of the substrate when in the second position.

Regarding claim 21, Chen (figure 5) is interpreted as disclosing that the optical signal propagating in the second direction is propagating under total internal reflection.

Regarding claims 22 & 23, Chen (figure 2) is interpreted as disclosing that the optical signal is reflected off the top surface and the bottom surface of the substrate under total internal reflection.

Regarding claims 24 & 25, Chen (figure 10) is interpreted as disclosing that the diffractive optical element is composed of a substantially transparent optical material wherein the diffractive optical element operates by total internal reflection.

Regarding claim 27, Chen (figure 1) is interpreted as disclosing a holographic optical element for use with an optical substrate, wherein an incident light signal **106** is propagating within the substrate **102** in a primary direction of propagation reflecting off a top surface **110** of the substrate under total internal reflection, comprising a plurality of spaced-apart strips **105** formed of an optically transparent material and disposed above the top surface of the substrate such that the strips collectively receive a first portion of the light signal and produce an output signal phase shifted from a second portion of the light signal reflected off the top surface of the substrate to produce a diffraction pattern within the substrate, and a suspension member **104** adjacent to the plurality of strips and disposed for allowing movement of the strips from a first position in which the incident light signal is altered by the holographic optical element and a second position in which the incident light signal is unaltered by the holographic optical element.

Regarding claim 28, Chen (figure 1) is interpreted as further disclosing that the suspension member comprises a plurality of flexible arms mounted to the top surface of the substrate by a plurality of mounting members, the flexible arms being coupled to the strips.

Regarding claims 29-31, Chen (figure 1) is interpreted as further disclosing that the mounting members having a height such that the strips are biased in the first position, wherein

the flexible arms are biased to return strips in the second position to the first position, and wherein flexible arms are coupled to the strips to allow uniform movement of the strips into the first and second positions.

Regarding claim 33, Chen (figure 1) is interpreted as further disclosing that the suspension member does not extend above the top surface of the substrate.

Regarding claim 34, Official Notice is taken that sapphire is very well known in the art to be used as substrate.

Regarding claim 36, Chen (figures 8 & 9) is interpreted as further disclosing that the strips are biased in the second position, and wherein an electrode **812** is disposed adjacent the strips for moving the strips into the first position.

Regarding claim 37, Chen (figure 5) is interpreted as further disclosing that the strips are linear and substantially perpendicular to the line bisecting an angle between the plane containing the input signal and the plane containing the output signal.

Regarding claims 39 and 40, Chen is interpreted as further disclosing that the strips are formed of poly silicon (col. 2, lines 45-53).

Regarding claim 43, Chen (figure 5) is interpreted as disclosing that the optical signal propagating in the second direction is propagating under total internal reflection.

Regarding claim 44, Chen (figure 1) is interpreted as disclosing an 1xN optical switch comprising a substrate **102** for transmitting an optical signal **106** within the substrate, where the optical signal propagates in the substrate in a first direction under total internal reflection, and N diffractive optical elements **105** disposed above a top surface of the substrate and each individually moveable relative to the substrate between a first position substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second position within evanescent field coupling with the optical signal to alter the propagation of the optical signal into a second direction.

Regarding claim 45, Chen (figure 10) is interpreted as further disclosing that each diffractive optical element is formed of a plurality of strips **1004** and **1006** forming a diffraction grating, where each strip has s substantially equal width and where each of the strips are spaced apart a substantially equal spacing.

Regarding claim 46, Chen (figure 10) is interpreted as disclosing an optical switch for use with a substrate, the optical switch comprising a plurality of strips **1004** and **1006**, disposed above a top surface of the substrate for movement relative to the substrate, each strip being spaced apart a spacing distance and having a strip width, whereby the sum of the spacing distance and the strip width is chosen such that a light signal traveling within the substrate under

total internal reflection and incident upon an area of the top surface below strips is reflected into a first diffracted order propagating within the substrate in a reflected direction of propagation defining an angle with respect to the incident direction of propagation and propagating within the substrate under total internal reflection (col. 5, lines 42-54).

Regarding claim 48, Chen (figure 10) is interpreted as further disclosing that the light signal is incident upon the diffraction grating at an angle equal to or greater than 35 degrees, wherein the angle of reflection is between about 90 and 145 degrees.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 5-7, 16, 17-19, 26, 32, 35, 41, 42 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US Patent 6,433,911), as applied in claims 1, 4, 27, 28 and 46.

Regarding claims 5-7, 17, 26, 32, 35 and 47, Chen is interpreted as disclosing all the claimed limitations, as described above, except for the specific claimed width, spacing, thickness, and grating period of the strips. However, it is well known in the art that such width,

spacing, thickness, and period grating of the strips can be varied if so desired. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide such claimed limitations, for the purpose of adjusting the amount of dispersion to a preferred range.

Regarding claims 16 and 41, Chen is interpreted as disclosing all the claimed limitations, as described above, except that the trips have an index of refraction higher than that of the substrate. However, it is well within the knowledge of one skill in the art that varying the index of refraction of the strips higher or lower than that of the substrate would change the angle of deflection of the light beam at the substrate top surface in the first position mode, depending on the specific application needed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the index of refraction of the strips and the substrate, for application-specific purposes.

Regarding claims 18, 19 and 42, Chen is interpreted as disclosing all the claimed limitations, as described above, except that the strips have a thickness selected to maximize the intensity of the optical signal. However, such thickness can clearly be found by experimentation. It is considered not inventive to discover the optimal range by routine experimentation. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a preferred thickness for the strips, for the purpose of maximizing the intensity of the optical signal.

3. Claims 13 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US Patent 6,433,911), as applied in claims 4 and 27, in view of Kimura (US Patent 6,288,829).

Regarding claims 13 and 38, Chen is interpreted as disclosing all the claimed limitations, as described above, except for the cross connections formed between the strips. Within the same field of endeavor, Kimura (figure 6A) is interpreted as disclosing the teaching of cross connecting members formed between the strips 132a. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the cross connections between the strips, as taught by Kimura, for the purpose of moving the strips in unison.

Other Information/Remarks

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Andreassen (GB 2189038) discloses that the use of holographic grating is very well known in optical switching functions.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Dinh whose telephone number is 571-272-2327. The examiner can normally be reached on M-F (9:30 AM - 6:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jack Dinh

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